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Atty. Dkt. No. SDUC1160-1 (041673-3603)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: WOODS et al.

Title: METHODS FOR THE  
DETERMINATION OF  
PROTEIN THREE-  
DIMENSIONAL STRUCTURE  
EMPLOYING HYDROGEN  
EXCHANGE ANALYSIS TO  
REFINE COMPUTATIONAL  
STRUCTURE PREDICTION

<p><b>CERTIFICATE OF MAILING</b></p> <p>I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date below.</p> <p>Stephen E. Rater (Printed Name)</p> <p><i>[Signature]</i> (Signature)</p> <p>6/29/07 (Date of Deposit)</p>
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Appl. No.: 10/577,179

International 11/1/2004  
Filing Date:

Examiner: Unknown

Art Unit: 1631

Confirmation 4048  
Number:

**INFORMATION DISCLOSURE STATEMENT**  
**UNDER 37 CFR §1.56**

Mail Stop Amendment-IDS  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of documents known to Applicants in order to comply with Applicants' duty of disclosure pursuant to 37 CFR §1.56.

A copy of each non-U.S. patent document and each non-patent document is being submitted to comply with the provisions of 37 CFR §1.97 and §1.98.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document which is determined to be a *prima facie* art reference against the claims of the present application.

### **TIMING OF THE DISCLOSURE**

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing date of the first Office Action on the merits.

### **RELEVANCE OF EACH DOCUMENT**

All of the documents are in English.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

Although Applicant believes that no fee is required for this Request, the Commissioner is hereby authorized to charge any additional fees which may be required for this Request to Deposit Account No. 19-0741.

Respectfully submitted,

Date 6/29/07

By SEP E. R

FOLEY & LARDNER LLP  
Customer Number: 30542  
Telephone: (858) 847-6711  
Facsimile: (858) 792-6773

Stephen E. Reiter  
Attorney for Applicant  
Registration No. 31,192

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Substitution for form 1449/PTO <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)		<b>Complete if Known</b>	
		Application Number	10/577,179
		Filing Date	11/1/2004
		First Named Inventor	Virgil L. Woods
		Art Unit	1631
		Examiner Name	Unknown
Sheet 1 of 16		Attorney Docket Number	SDUC1160-1 (041673-3603)

**U.S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number Number-Kind Code <sup>2</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	4,762,785	08-09-1988	Comai	
	A2	5,451,513	09-19-1995	Maliga et al.	
	A3	5,545,817	08-13-1996	McBride et al.	
	A4	5,658,739	08-19-1997	Woods, Jr.	
	A5	6,291,189	09-18-2001	Woods, Jr.	
	A6	6,331,400	12-18-2001	Woods, Jr.	
	A7	6,599,707	07-29-2003	Woods, Jr.	

**UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	U.S. Patent Application Document Serial Number-Kind Code <sup>2</sup> (if known)	Filing Date of Cited Document MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

**FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document Country Code <sup>3</sup> Number <sup>4</sup> Kind Code <sup>5</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>

**NON PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>6</sup>
	A8	Altmann et al., "Pathways and Intermediates in Forced Unfolding of Spectrin Repeats", Structure (Camb), 10:1085-1096, 2002	
	A9	Bai et al., "Thermodynamic Parameters from Hydrogen Exchange Measurements", Methods Enzymol., 259:344, 1995	

 Examiner  
Signature

 Date  
Considered

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	A10	Bai et al., "Primary Structure Effects on Peptide Group Hydrogen Exchange", Proteins: Structure, Function, and Genetics 17:75-86, 1993	
	A11	Baldwin, "Temperature Dependence of the Hydrophobic Interaction in Protein Folding", Proc Natl Acad Sci USA, 83:8069-72, 1986	
	A12	Beasty et al., "Characterization of an Early Intermediate in the Folding of the $\alpha$ Subunit of Tryptophan Synthase by Hydrogen Exchange Measurement", Biochemistry, 24:3547-3553, 1985	
	A13	Beaton, A. and Tukey, J.W., "The Fitting of Power Series, Meaning Polynomials, Illustrated on Band-Spectroscopic Data", Technometrics, 16: 147-192, 1975	
	A14	Benjamin et al., "Long-Range Changes in a Protein Antigen Due to Antigen-Antibody Interaction", Biochemistry, 31:9539-0545, 1992	
	A15	Breddam, "Serine Carboxypeptidases. A Review", Carlsberg Res. Commun., 51:83-128, 1986	
	A16	Burz et al., "Mapping Structural Perturbations in Escherichia Coli Aspartate Transcarbamylase by Medium Resolution Hydrogen Exchange", Biophys. J., 49:70-72, 1986	
	A17	Chen et al., "Probing the ligand binding domain of the GluR2 receptor by proteolysis and deletion mutagenesis defines domain boundaries and yields a crystallizable construct", Protein Science, 7:2623-2630, 1998	
	A18	Chung et al., "Hydrogen exchange properties of proteins in native and denatured states monitored by mass spectrometry and NMR", Protein Sci., 6:1316-24, 1997	
	A19	Cohen et al., "Probing the solution structure of the DNA-binding protein Max by a combination of proteolysis and mass spectrometry", Protein Science, 4:1088-1099, 1995	

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	A20	Connelly et al., "Isotope Effects in Peptide Group Hydrogen Exchange", Proteins: Struct. Funct. Genet., 17:87-92	
	A21	D'Aquino et al., "The Magnitude of the Backbone Conformational Entropy Change in Protein Folding", Proteins, 25:143-56, 1996	
	A22	Deng and Smith, "Identification of Unfolding Domains in Large Proteins by Their Unfolding Rates", Biochemistry, 37:6256-6262, 1998	
	A23	Dharmasiri and Smith, "Mass Spectrometric Determination of Isotopic Exchange Rates of Amide Hydrogens Located on the Surfaces of Proteins", Anal. Chem., 68:2340-2344, 1996	
	A24	Dunker et al., "Protein Disorder and the Evolution of Molecular Recognition: Theory, Predictions and Observations", Pac. Symp. Biocomput., 3:473-484, 1998	
	A25	Engen et al., "Investigating Protein Structure and Dynamics by Hydrogen Exchange MS", Analytical Chemistry, 73:256A-265A, 2001	
	A26	Englander et al., "Protein hydrogen exchange studied by the fragment separation method", Anal. Biochem., 147:234-244, 1985	

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	A27	Englander et al., "Hydrogen-Tritium Exchange Survey of Allosteric Effects in Hemoglobin", Biochem., 26:1846-1850, 1987		
	A28	Englander et al., "Individual Breathing Reactions Measured in Hemoglobin by Hydrogen Exchange Methods", Biophys. J., 10:577, 1979		
	A29	Englander et al., "Hydrogen-Tritium Exchange of the Random Chain Polypeptide", Biopolymers, 7:379-393, 1969		
	A30	Englander et al., "Hydrogen Exchange Studies of Respiratory Proteins", J. Biol Chem., 248:4852-4861, 1973		
	A31	Englander et al., "Structure and Energy Change in Hemoglobin by Hydrogen Exchange Labeling", Methods Enzymol., 232:26-42, 1994		
	A32	Englander et al., "Hydrogen-Tritium Exchange", Methods Enzymol., 26:406-413, 1972		
	A33	Englander et al., "Hydrogen-Tritium Exchange", Methods Enzymol., 49:24-39, 1978		

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	A34	Englander et al., "Protein structure change studied by hydrogen-deuterium exchange, functional labeling, and mass spectrometry", Proc. Natl. Acad. Sci., USA 100:7057-7062, 2003		
	A35	Englander et al., "Hydrogen exchange: The modern legacy of Linderstrom-Lang", Protein Science, 6:1101-9, 1997		
	A36	Fusek et al., "Enzymic Properties of Thermopsin", J. Biol. Chem., 265:1496-1501, 1990		
	A37	Garner et al., "Predicting Disordered Regions from Amino Acid Sequence: Common Themes Despite Differing Structural Characterization", Genome Inform., 9:201-214, 1998		
	A38	Gomez et al., "The Heat Capacity of Proteins", Proteins, 22:404-12, 1995		
	A39	Grum et al., "Structures of Two Repeats of Spectrin Suggest Models of Flexibility", Cell, 98:523-535, 1999		
	A40	Habermann et al., "Energetics of hydrogen bonding in proteins: A model compound study", Protein Sci., 5:1229-39, 1996		

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	A41	Hamuro and Woods, "High Resolution, High-Throughput Amide Deuterium Exchange-Mass Spectrometry (DXMS) Determination of Protein Binding Site Structure and Dynamics: Utility in Pharmaceutical Design", J. Cell. Biochem., 37:89-98, 2001		
	A42	Hamuro et al., "Domain Organization of D-AKAP2 Revealed by Enhanced Deutrium Exchange-Mass Spectrometry (DXMS)", J. Mol. Biol., 321:703-714, 2002		
	A43	Hamuro et al., "Phosphorylation Driven Motions in the COOH-terminal Src Kinase, Csk, Revealed Through Enhanced Hydrogen-Deuterium Exchange and Mass Spectrometry (DXMS)", J. Mol. Biol., 323:871-881, 2002		
	A44	Hamuro et al., "Dynamics of cAPK Type II $\beta$ Activation Revealed by Enhanced Amide H/ <sup>2</sup> H Exchange Mass Spectrometry (DXMS)", J. Mol. Biol., 327:1065-1076, 2003		
	A45	Hilser et al., "Structure-based statistical thermodynamic analysis of T4 lysozyme mutants: structural mapping of cooperative interactions", Biophys. Chem., 64:69-79, 1997		
	A46	Hilser et al., "The structural distribution of cooperative interactions in proteins: Analysis of the native state ensemble", Proc Natl Acad Sci USA, 95:9903-8, 1998		
	A47	Hilser et al., "The Enthalpy Change in Protein Folding and Binding: Refinement of Parameters for Structure-Based Calculations", Proteins, 26:123-33, 1996		

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	A48	Hilser et al., "Predicting the Equilibrium Protein Folding Pathway: Structure-Based Analysis of Staphylococcal Nuclease", Proteins, 27:171-83, 1997		
	A49	Hilser, et al., "Structure-based Calculation of the Equilibrium Folding Pathway of Proteins. Correlation with Hydrogen Exchange Protection Factors", J. Mol. Biol., 262:756-72, 1996		
	A50	Hilser, V.J., "Protein Structure, Stability, and Folding", Methods Mol Biol, 168:93-116, 2001		
	A51	Hoofnagle et al., "Changes in protein conformational mobility upon activation of extracellular regulated protein kinase-2 as detected by hydrogen exchange", Proceedings, National Academy of Sciences, 98:956-961, 2001		
	A52	Katta et al., "Hydrogen/Deutrium Exchange Electrospray Ionization Mass Spectrometry: A Method for Probing Protein Conformational Changes in Solution", J. Am. Chem. Soc., 115:6317-6321, 1993		
	A53	Kim et al., "Influence of Charge on the Rate of Amide Proton Exchange", Biochemistry, 21:1, 1982		
	A54	Kim et al., "Protein Internal Flexibility and Global Stability: Effect of Urea on Hydrogen Exchange Rates of Bovine Pancreatic Trypsin Inhibitor", Biochemistry, 32:9609-9613, 1993		

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				Filing Date	11/1/2004
				First Named Inventor	Virgil L. Woods
				Art Unit	1631
				Examiner Name	Unknown
				Attorney Docket Number	SDUC1160-1 (041673-3603)
Sheet	8	of	16		

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	A55	Kim et al., "Intramolecular Interactions in Chemically Modified Escherichia coli Thioredoxin Monitored by Hydrogen/Deuterium Exchange and Electrospray Ionization Mass Spectrometry", Biochemistry, 40:14413-21, 2001		
	A56	Kim et al., "Site-Specific Amide Hydrogen/Deuterium Exchange in E. coli Thioredoxins Measured by Electrospray Ionization Mass Spectrometry", J Am Chem Soc, 123:9860-6, 2001		
	A57	Kim et al., "Conformational changes in chemically modified Escherichia coli thioredoxin monitored by H/D exchange and electrospray ionization mass spectrometry", Protein Sci, 11:1320-9, 2002		
	A58	Krishnan et al., "Purification of an acid protease and a serine carboxypeptidase from Aspergillus niger using metal-chelate affinity chromatography", J. Chromatography, 329:165-170, 1985		
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	A60	Lamzin et al., "Current state of automated crystallographic data analysis", Nature Structural Biology, November 7, 2000, Supplement:978-981, 2000		
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	A67	Louie et al., "Salt, phosphate and the Bohr effect at the hemoglobin beta chain C terminus studied by hydrogen exchange", J. Mol. Biol., 201:765-772, 1988		
	A68	Mallikarachchi et al., "Effects of ATP and CTP on the Conformation of the Regulatory Subunit of Escherichia coli Aspartate Transcarbamylase in Solution: A Medium-Resolution Hydrogen Exchange Study", Biochemistry, 28:5386-5391, 1989		

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	A75	Milne et al., "Determinants of protein hydrogen exchange studied in equine cytochrome c", Protein Sci., 7:739-745, 1998		

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	A80	Paci et al., "Unfolding proteins by external forces and temperature: The importance of topology and energetics", Proc. Natl. Acad. Sci. U.S.A., 97:6521-6526, 2000		
	A81	Paterson et al., "An Antibody Binding Site on Cytochrome c Defined by Hydrogen Exchange and Two-Dimensional NMR", Science, 249:755-759, 1990		
	A82	Peterson et al., "Mass-spectrometric analysis of agonist-induced retinoic acid receptor $\gamma$ conformational change", Biochem J, 362:173-81, 2002		

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				10/577,179	
				Filing Date	
				11/1/2004	
				First Named Inventor	
		Virgil L. Woods			
Art Unit		1631			
Examiner Name		Unknown			
Attorney Docket Number		SDUC1160-1 (041673-3603)			
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	A104	Winger et al., "Probing Qualitative Conformation Differences of Multiply Protonated Gas-Phase Proteins via H/D Isotopic Exchange with D <sub>2</sub> O", J. Am. Chem. Soc., 114:5897-5989, 1992		
	A105	Woods Jr. et al., "High Resolution, High-Throughput Amide Deuterium Exchange-Mass Spectrometry (DXMS) Determination of Protein Binding Site Structure and Dynamics: Utility in Pharmaceutical Design", Journal of Cellular Biochemistry, 37:89-98, 2001		
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	A109	Xiaoming et al., "A Novel Carboxylesterase from Aspergillus niger and Its Hydrolysis of Succinimide Esters", Carlsberg Res. Commun., 54:241-249, 1989		
	A110	Xie, et al., "Thermodynamic characterization of an equilibrium folding intermediate of staphylococcal nuclease", Protein Sci., 3:2175-84, 1994		

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	A111	Yan et al., "Hydrogen/deuterium exchange and mass spectrometric analysis of a protein containing multiple disulfide bonds: Solution structure of recombinant macrophage colony stimulating factor-beta (rhM-CSF $\beta$ )", Protein Sci., 11:2113-24, 2002	
	A112	Yan et al., "Crystal Structure of the Repetitive Segments of Spectrin", Science, 262:2027-2030, 1993	
	A113	Zawadzki et al., "Dissecting interdomain communication within cAPK regulatory subunit type II $\beta$ using enhanced amide hydrogen/deuterium exchange mass spectrometry (DXMS)", Protein Sci., 12:1980-1990, 2003	
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